IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An illumination system comprising:

a light source; and ~~for emitting light of selected wavelength(s) in an optical path toward a pupil,~~

~~means for shaping the light from the source into a shaped illumination pattern having one or more zones where the intensity of the light in the zones varies to produce a shaped illumination pattern for each zones;~~

~~means for optically integrating light incident on the pupil;~~

~~a square shaped aperture disposed proximate the pupil for squaring the edges of the shaped illumination distribution pattern; and~~

~~optical means for combining the shaped illumination to illuminate a photomask.~~

a beam shaping optical system arranged in an optical path from said light source,

wherein said beam shaping optical system comprises a masking aperture comprising:

a translucent substrate, and

a half-tone dithered pattern on the substrate, said half-tone dithered pattern comprising an array of pixels.

2. (Currently Amended) The illumination system of claim 1, wherein the ~~means for~~ beam shaping ~~the light~~ optical system comprises a plurality of masking apertures.

3. (Currently Amended) The illumination system of claim 2, wherein at least one of the masking apertures comprises an opaque plate with one or more apertures.

4. (Currently Amended) The illumination system of claim 3, wherein at least one of the masking apertures comprises a translucent plate with a central obscuration.

5. (Currently Amended) The illumination system of claim 4, wherein the central obscuration is circular or square.

6. (Currently Amended) The illumination system of claim 1, further comprising an optical integrator arranged on a light exit side of said beam shaping optical system. ~~wherein the means for optically integrating light is a fly's eye lens.~~

7. (Currently Amended) The illumination system of claim ~~1 wherein the~~ 6, further comprising a square shaped aperture ~~comprises a translucent substrate and a square pattern or a metal plate with a square aperture.~~ arranged between said beam shaping optical system and said optical integrator.

8. (Currently Amended) The illumination system of claim 1, wherein the beam shaping optical system is constructed to produce a shaped illumination pattern that has a shape selected from the group consisting of round, square, and elliptical shapes.

9 (Currently Amended) The illumination system of claim 8, wherein the beam ~~means for~~ shaping ~~the light~~ optical system comprises ~~one or more~~ a diffractive optical ~~elements~~ element.

10. (Currently Amended) The illumination system of claim 8, wherein the ~~means for~~ beam shaping optical system ~~the light from the source~~ comprises ~~one or more beam splitters~~ a beam splitter located between the source of light and ~~the~~ an exit pupil of said illumination system.

11. (Currently Amended) The illumination system of claim 1, ~~10 wherein the optical means for combining the shaped illumination pattern comprises a refractive element for each beam~~ further comprising a relay optical system arranged between said light source and an exit pupil of said illumination system.

12. (Currently Amended) ~~The illumination system of claim 1~~ An illumination system comprising:

a light source; and

a beam shaping optical system arranged in an optical path from said light source;

wherein ~~the means for shaping an illumination pattern~~ said beam shaping optical system comprises a masking aperture comprising:

a translucent substrate;

a half-tone dithered ~~image~~ pattern on the substrate, said half-tone dithered ~~image~~ pattern comprising an array of pixels, each pixel of a clear or opaque type and of the same size, said clear and opaque pixels for respectively passing and blocking incident light, wherein the number, size, and type of the pixels are chosen in accordance with:

(a) the wavelength of light used to illuminate the photomask, and

(b) the size and shape of the features of the photomask~~, for generating a continuous illumination intensity pattern on the photomask with illumination intensity at any location controlled by the half-tone dithered image~~.

13. (Currently Amended) The illumination system of claim 12, wherein the half-tone dithered ~~image~~ pattern comprises an array of diffraction elements and each diffraction element is a dither ~~image~~ pattern of clear or opaque pixels.

14. (Currently Amended) The illumination system of claim 12, further comprising

an optical integrator arranged in an optical path from said beam shaping optical system; and

a square-shaped aperture disposed between said optical integrator and said beam shaping optical system.

~~wherein the square aperture is formed the same as the dithered image~~.

15. (Original) The illumination system of claim 13, wherein each diffraction element pixel comprises an n x n dithered matrix of pixels, the intensity of each element is defined by the number and type of pixels in its dithered matrix and wherein the pixels in each matrix are dithered to avoid artifacts.

16. (Original) The illumination system of claim 13, wherein the relative intensity of each subpixel is defined by a recursion relationship where:

$$D^n = \begin{vmatrix} 4D^{n-2} + D_{00}^2 U^{n-2} & 4D^{n-2} + D_{01}^2 U^{n-2} \\ 4D^{n-2} + D_{10}^2 U^{n-2} & 4D^{n-2} + D_{11}^2 U^{n-2} \end{vmatrix}$$

~~where:~~ and

$$U^n = \begin{vmatrix} 1 & 1 & \dots & 1 \\ 1 & & & \\ \cdot & & & \\ \cdot & & & \\ \cdot & & & \\ 1 & & & \end{vmatrix}.$$

17. (Currently Amended) The illumination system of claim 16, wherein the matrix of pixels comprises an 8 x 8 matrix and the relative intensity, [[D8,]] $\underline{D^8}$, comprises :

$$D^8 = \begin{vmatrix} 0 & 32 & 8 & 40 & 2 & 34 & 10 & 42 \\ 48 & 16 & 56 & 24 & 50 & 18 & 58 & 26 \\ 12 & 44 & 4 & 36 & 14 & 46 & 6 & 38 \\ 60 & 28 & 52 & 20 & 62 & 30 & 54 & 22 \\ 3 & 35 & 11 & 43 & 1 & 33 & 9 & 41 \\ 51 & 19 & 59 & 27 & 49 & 17 & 57 & 25 \\ 15 & 47 & 7 & 39 & 13 & 45 & 5 & 37 \\ 63 & 31 & 55 & 23 & 61 & 29 & 53 & 21 \end{vmatrix}.$$

18. (Currently Amended) The illumination system of claim [[1]] 6, wherein the ~~means for optically integrating light on the pupil is a plurality of fly's eye lenses.~~ optical integrator is a fly's eye array of lenslets.

19. (Canceled)

20. (Canceled)

21. (Canceled)

22. (Canceled)

23. (New) A lithographic apparatus, comprising:

an illumination system arranged to illuminate a mask; and

a projection optical system arranged to project a radiation from said mask onto a substrate,

wherein said illumination system comprises a beam shaping optical system having a masking aperture comprising:

a translucent substrate, and

a half-tone dithered pattern on the substrate, said half-tone dithered pattern comprising an array of pixels.

24. (New) The lithographic apparatus of claim 23, wherein the beam shaping optical system comprises a plurality of masking apertures.

25. (New) The lithographic apparatus of claim 24, wherein at least one of the masking apertures comprises an opaque plate with one or more apertures.

26. (New) The lithographic apparatus of claim 25, wherein at least one of the masking apertures comprises a translucent plate with a central obscuration.

27. (New) The lithographic apparatus of claim 26, wherein the central obscuration is circular or square.

28. (New) The lithographic apparatus of claim 23, wherein said illumination system further comprises an optical integrator arranged on a light exit side of said beam shaping optical system.

29. (New) The lithographic apparatus of claim 28, wherein said illumination system further comprises a square shaped aperture arranged between said beam shaping optical system and said optical integrator.

30. (New) The lithographic apparatus of claim 23, wherein the beam shaping optical system is constructed to produce a shaped illumination pattern that has a shape selected from the group consisting of round, square, and elliptical shapes.

31. (New) The lithographic apparatus of claim 30, wherein the beam shaping optical system comprises a diffractive optical element.

32. (New) The lithographic apparatus of claim 30, wherein the beam shaping optical system comprises a beam splitter located between the source of light and an exit pupil of said illumination system.

33. (New) The lithographic apparatus of claim 23, further comprising a relay optical system arranged between said light source and an exit pupil of said illumination system.

34. (New) The lithographic apparatus of claim 23, wherein said half-tone dithered pattern on said substrate comprises an array of pixels, each pixel being a clear or opaque type and of the same size, said clear and opaque pixels being for passing and blocking respectively incident light, wherein the number size, and type of the pixels are chosen in accordance with:

(a) the wavelength of light used to illuminate the photomask, and

(b) the size and shape of the features of the photomask.

35. (New) The lithographic apparatus of claim 34, wherein the half-tone dithered pattern comprises an array of diffraction elements and each diffraction element is a dithered pattern of clear or opaque pixels.

36. (New) The lithographic apparatus of claim 34, wherein said illumination system further comprises:

an optical integrator arranged in an optical path from said beam shaping optical system; and

a square-shaped aperture disposed between said optical integrator and said beam shaping optical system.

37. (New) The lithographic apparatus of claim 36, wherein each diffraction element pixel comprises an n x n dithered matrix of pixels, the intensity of each element is defined by the number and type of pixels in its dithered matrix and wherein the pixels in each matrix are dithered to avoid artifacts.

38. (New) The lithographic apparatus of claim 36, wherein the relative intensity of each subpixel is defined by a recursion relationship where:

$$D^n = \begin{vmatrix} 4D^{n/2} + D_{00}^2 U^{n/2} & 4D^{n/2} + D_{01}^2 U^{n/2} \\ 4D^{n/2} + D_{10}^2 U^{n/2} & 4D^{n/2} + D_{11}^2 U^{n/2} \end{vmatrix}$$

and

$$U^n = \begin{vmatrix} 1 & 1 & \ldots & 1 \\ 1 & & & \\ \cdot & & & \\ \cdot & & & \\ \cdot & & & \\ 1 & & & \end{vmatrix}.$$

39. (New) The lithographic apparatus of claim 38, wherein the matrix of pixels comprises an 8 x 8 matrix and the relative intensity, D^8, comprises :

$$D^8 = \begin{vmatrix} 0 & 32 & 8 & 40 & 2 & 34 & 10 & 42 \\ 48 & 16 & 56 & 24 & 50 & 18 & 58 & 26 \\ 12 & 44 & 4 & 36 & 14 & 46 & 6 & 38 \\ 60 & 28 & 52 & 20 & 62 & 30 & 54 & 22 \\ 3 & 35 & 11 & 43 & 1 & 33 & 9 & 41 \\ 51 & 19 & 59 & 27 & 49 & 17 & 57 & 25 \\ 15 & 47 & 7 & 39 & 13 & 45 & 5 & 37 \\ 63 & 31 & 55 & 23 & 61 & 29 & 53 & 21 \end{vmatrix} .$$

40. (New) The lithographic apparatus of claim 28, wherein the optical integrator is a fly's eye array of lenslets.